A study of the response of a Zr modified 2014 aluminium alloy subjected to fatigue loading

P. Cavaliere

INFM - Dept. of Ingegneria dell'Innovazione, University of Lecce, I-73100-Lecce, Italy

Abstract

The present work illustrates the fatigue response differences of a Zr stabilized Al-Cu alloy and the correnspondingunmodified one.

The fatigue response of the materials has been studied in both conditions by using a fatigue test machine working at 250 Hz. The mechanisms governing fatigue life, cyclic deformation and fracture characteristics are studied as a function of the magnitude of the applied stress and intrinsic microstructural evolution. The curve representing the stress amplitude fatigue life response of the material in the Zr stabilised condition showed a classical behaviour with increasing fatigue life as cyclic stress decreases. A fatigue life of 10^7 cycles at 110 MPa was recorded.

The microstructure in the as-received and deformed conditions was characterised by optical and electron microscopy techniques (TEM); the crack growth and propagation was determined by scanning electron microscopy observations (FEGSEM). The microstructure was characterised by very small equiaxed grains; fracture surfaces showed distinct regions of stable crack growth and overload and the micromechanisms of damage initiation and propagation were clearly recognised.

Keywords: 2014+Zr, Fatigue life, FEGSEM, TEM.